FAA Aviation News
REPRINT
AVIATION SAFETY FROM COVER TO COVER

OPERATIONS AT NONTOWERED AIRPORTS

Uncontrolled Aviation?

by Patricia Mattison

In a perfect world there would not be any rules to live by. There would be no need for control and the accompanying restrictions. Children would automatically be mindful and respectful of their parents. Drivers would instinctively govern their speed and conduct on the roads, etc., etc. Life, however, is not perfect and the powers that govern us determine the rules necessary to live by. Occasionally there are rules created in the Golden Ages that have made complete sense to the governing agent. Those same, sensible laws in this day and age may seem archaic.

Take for instance "Blue Laws." Some of these laws, designed to control conduct during the colonial period, still remain on the civil law books. Today they are nothing more than humorous anecdotes to the modern population. For instance, in some States it was illegal to kiss your spouse in public on a Sunday. To do so meant languishing in the stocks until the offender appreciated the error of his or her ways. (It is fortunate for us that that particular law is not enforced; most of us would spend time in the stocks.)

Aviation, and resultant aviation law, has also evolved immensely since its inception from the progenitor of flight, the hot air balloon, to today's complex aircraft and spacecraft. I really find it hard to believe that the ancestors of aviation envisioned the magnitude of aircraft and pilots that there are today. Regulation of aircraft and pilots, as we know, has been a constantly changing issue.

The necessity for more regulation arouse as air commerce evolved, for the safety of passengers and people on the surface and to provide guidance and direction for the pilot.

In 1926 the Bureau of Air Commerce developed from the Department of Commerce's Aeronautics Branch. Then in 1936 the Civil Aeronautics Authority (CAA) was developed to control certification of air carrier routes, and Air Traffic Control was born. The year 1940 brought the split of the CAA into the Civil Aeronautics Board and the Civil Aeronautics Administration. With the split came the advent of governmental control of airmen, safety enforcement, rule making, and accident investigation.

As the aviation industry grew, regulation became increasingly necessary in part because of the sheer volume of aviation activity. In 1958 Congress gave the Federal Aviation Agency sole responsibility and authority to regulate and enforce the regulations. And the Federal Aviation Regulations are constantly changing to keep up with safety requirements of a continually growing aviation industry. In 1967 the Federal Aviation Agency was placed in the newly created Department of Transportation and renamed the Federal Aviation Administration.

In order to tell the whole story, statistics from 1994-1995 can show us how large aviation has become since its inception. Statistics show that there are 639,184 active pilots in the U.S. alone. Two hundred and fifty seven thousand, eight hundred and fifty seven (257,857) of those active pilots are Commercial pilots or ATP's working for a living in the aviation industry. That's a whole lot of people relying on 170,000 aircraft to get them safely from point A to point B. Those same 170,000 aircraft logged an estimated 24,000,000 hours of flight time in one year.

Speaking of points A and B, there are 18,224 airports in the U.S., including Alaska, and only 447 of those are controlled airports—have operating control towers staffed by air traffic controllers. Here in Alaska we have eight controlled fields and approximately 1,100 identified landing areas. In addition there are lakes and outlying strips in all states that are not officially counted but used all the same.

Referring to the statistical information above, it becomes obvious at this point that most air traffic control is "do-it-yourself" in nature. Air fields that had no positive control were at one time referred to as "uncontrolled" airports. "AHA!!!!," thought pilots, "An uncontrolled airport, huh!? I can do pretty much what I want." So the FAA changed the name, and with the name change, the connotation, to nontowered airports. (Nontowered refers to either airports that have no operating control tower or airports during the time when the control tower is not operating.) By doing so the responsibility of control was delegated to the users. Through the use of radio contact on a Common Traffic Advisory Frequency (CTAF) and heightened traffic scanning at any given field, aircraft in the vicinity of that field can determine traffic flow and other information necessary for safe takeoff or landing. In the

event that a CTAF is not designated at an airfield, the multicom frequency listed in the *Aeronautical Information Manual* (AIM) should be used.

Even though there is no Federal Aviation Regulation directly requiring communication at a nontowered field, the AIM gives pilots guidance in that area. The pilot becomes the controlling influence, and the subsequent responsibility of safety rests with the pilot.

As student pilots we were introduced to the seeming confusion of communications via an aircraft radio. At first the ability to communicate intelligently via this new medium was fraught with stumbling over your tongue and embarrassing mistakes. Soon the fledgling pilot had a handle on the daunting microphone and radio and began to sound like a pilot. (The mike intimidates most student pilots during initial flight training, second only to landing.)

Most of us received our first flight training either exclusively or in part at a nontowered airport. There we were the captain of our own ships, the masters of our fates. And when we were students we were probably the most diligent pilots we would ever be in our entire career. Everything was done by the book. The FAA Regulations and the AIM were our aviation bible, the good book by which we ate, slept, and dreamt aviation. Flight to a nontowered airport gave a sense of freedom and adventure but implied a responsibility as well. We followed the rules to the letter.

Approaching the nontowered field, attempting to sound professional, we reported on the CTAF inbound, then again on a 45 degree entry at pattern altitude, at the downwind, base leg, and final portions of our landing. Departing the field we reported our departure position and proposed departure path. We, as student pilots tried to do our best and to do it all by the book. Perhaps our instructor was within earshot, or it could have been that we were excited and amazed at hearing our own voice in the headset. Whatever the driving force, we did it right.

So what happened to the attention to detail when we became "Real Pilots"???? Suddenly it appears that all that valuable training flew right out the window. Radios were turned off at nontowered airports. Nonstandard patterns were improvised on the spot. It seems a few pilots have forgotten the common sense and the courteous attitude required in the nontowered environment to assure safety.

For example, straight-in approaches, common at tower controlled fields, can be a real problem at a busy nontowered field.

Several years ago, when I had a Cessna Pilot Center, I was out doing touch and go landings with a relatively new student pilot. It was a cold—as cold as Southern California gets—overcast day. The cloud bases were at 1,500 feet, and aircraft had been making the VOR approach, circle to land, to the field most of the day. My student was making all of the appropriate position reports on downwind, base, and final, as well as announcing that we were going to make touch and go landings. At one point we had turned to final approach and were well established on the approach when I heard, from the ground, "Patti, make an immediate left diving turn, NOW!!!" Recognizing the voice and the urgency, I instinctively complied. A twin Cessna that had been on a long, straight in approach flew past within feet of us, narrowly missing my plane, and landed. Had I not automatically reacted we would have been involved in a mid-air collision with the twin.

A quick thinking former student on the ground in the run-up area had the presence of mind to alert us of impending danger. As a result of that warning my student and I avoided becoming a statistic. Later, after I quit shaking—not out of fear but with fury—I went to the pilot of the twin. I read him the riot act, loud and long, about announcing position and listening on the radio for traffic in the pattern. Comment from the pilot was that it was legal to land from that approach. Legal, it might have been, but not a safe thing to do at a nontowered field. There is no way a pilot can get a good view of traffic in the pattern while on a straight in approach. See and avoid is still the best policy.

By flying a circle to land maneuver, from a straight in approach, while remaining at an altitude above traffic pattern altitude, opportunity is given to other aircraft in the vicinity to observe your airplane entering the pattern and react accordingly. Always keep in mind that, like the danger to your car in a parking lot because of increased traffic, most accidents happen in the heavily trafficked vicinity of an airport.

Another situation that can cause an accident, especially at nontowered fields, occurs during the 45 degree entry to downwind. To descend while entering the 45-degree courts disaster. When two aircraft are entering the downwind, a pilot may not see another aircraft. If one aircraft is low wing and one high wing, the possibility of impact is heightened. The best plan of action would be to slow the aircraft to pattern speed and descend to pattern altitude before arriving at the 45 degree entry to the pattern.

Once in the pattern at the downwind position, remain vigilant

for other traffic and expect the unexpected. Report your position along with your intentions, i.e., downwind for touch and go, full stop, etc. In addition to reporting each turn in the pattern, it is imperative to keep constant vigilance for other aircraft. The traffic pattern is one place where paranoia is indeed the height of awareness. On the road this heightened state of awareness is referred to as defensive driving.

The traffic pattern is no place to become complacent. If you have passengers onboard, ask them to become part of the crew by looking for traffic and alerting you to that traffic. This same advice is sound while taxiing on the surface.

Surface communication is as necessary at a nontowered field as it is at one controlled by a ground controller. Announce your position on CTAF when you taxi out of a tiedown area. Inform area traffic which runway you intend to operate on.

Communication, while taxiing will facilitate initiating correct reactions from other aircraft in the air as well as on the field. Taxiing towards a desired runway only to find that another plane is taxiing in the opposite direction can result in a very confusing situation. I have had the experience of being nose to nose with another aircraft and not having the space to turn on a very narrow taxiway. Playing a game of chicken in an aircraft is no fun and stupid as well. After stopping on the taxiway, one of you has to get out and manually turn your airplane. Such embarrassment can be avoided by complete communications.

Announce your intentions on CTAF before beginning your takeoff roll, then wait a bit for a reply. Turn your airplane towards the oncoming traffic and take a good look for traffic in the area. Be prepared for an unexpected maneuver and allow sufficient time for spacing for arriving aircraft.

Small aircraft close in can appear to be larger aircraft at a greater distance. Unless you are sure of the size and speed of the landing aircraft, wait for that plane to land and taxi off before beginning your takeoff roll.

I have seen aircraft taking off in tandem. A consideration with regard to tandem takeoff that I have always had is, what happens if the lead aircraft has a problem and comes to a stop on the runway? Would the aircraft in trail have a sufficient amount of time to stop? Just food for thought.

The Aeronautical Information Manual (AIM) tells us that the correct way to depart an airport is to continue straight out or exit with a 45 degree turn toward the crosswind to depart the area. It is amazing to see the variation of departures, unannounced, that pilots can dream up. A normal departure for a pilot I knew of was to rotate as soon as the plane would fly and immediately execute a hard right hand turn perpendicular to the runway. The fact that there was a grove of trees along the runway edge was of no concern to that pilot; that is, until he hit them. Fortunately, the pilot wasn't hurt, but the aircraft was in ruins, never to fly again, and the air blue from expletives.

Departing the area in a climb attitude reduces forward visibility. "S" turns on climb out increase forward visibility and are a good practice. In the vicinity of an airport arriving and departing traffic can be heavy. Keep track of other aircraft positions through communication. Contact aircraft in the vicinity in the blind on CTAF or other designated frequency. Report leaving the area, include your position and altitude. Who knows, another pilot may be entering the area at your position.

Another significant situation at nontowered airports is these are where the aircraft without radios are likely to be found. Whether they are homebuilts or antiques, our flexible Federal Aviation Regulations allow aircraft to operate without radios. The pilots of these radioless aircraft do not have an important anticollision tool—communications—but they do have a good set of eyes and must use them. Adhering to standard traffic pattern procedures is important for all concerned at nontowered airports, but it is especially true for aircraft without radios that cannot make position reports on CTAF.

I am sure that there is a plethora of advice and information on flying in the vicinity of nontowered airports that you have heard from instructors and other fellow pilots throughout your career in aviation. Experience is always the best teacher. We learn experientially during each and every flight. Whether the experience is good or bad depends on how well we follow the rules.

The rules, the Federal Aviation Regulations, the AIM, common sense, and courtesy serve us well. If we all try our best to be competent pilots, flying defensively and not allowing complacency to enter our lives, it stands to reason that we will be safer pilots overall. As my father-in-law, once an Army Air Corps pilot, always tells me, "Fly safe, keep your eyes open, and your head on a swivel."

Good advice from an old, not so bold, pilot.

Ms. Mattison is the Safety Program Manager at FAA Juneau, Alaska, Flight Standards District Office. For information on pilot operations at nontowered airports consult Chapter 4 of the AIM.

STAYING THE COURSE

by Phyllis-Anne Duncan

After you've hung around enough airports without control towers—or "nontowered airports" as we bureaucrats like to call them—you see pretty much an infinite number of nonstandard traffic patterns being flown. (For the purposes of this article, assume that a nontowered airport is either one where no tower exists or one where there is a tower but the tower is closed/not operating.) There are those absolutely conscientious people who adhere to the published traffic pattern altitude (TPA), the 45º downwind entry, the turns to base and final over the established checkpoints. Then there are those who are, well, somewhat inventive. Whatever pattern gets them on the ground works for them. Unfortunately, this "whatever pattern" attitude is about as "clueless" as the movie of the same name.

Statistics have shown that the most likely place for a midair collision is the traffic pattern of a nontowered airport on a VFR day. The likelihood of a midair is reduced when pilots not only see and avoid but also when they approach a nontowered airport in an orderly, standard fashion and broadcast their intentions on the radio (if so equipped).

The regulations stipulate that all turns in airplanes in the vicinity of an airport shall be to the left, unless otherwise indicated, and that's about all the regulations say. For aircraft on instrument flight plans, there are specific procedures to follow and instructions given by controllers, not to mention radar coverage and separation standards.

However, if that IFR flight plan ends with an instrument approach to a nontowered airport, then the same standards and recommendations apply as for VFR pilots at those airports.

Which is why FAA, along with industry, many years ago developed recommended standard entries and recommended standard traffic patterns for nontowered airports, as well as standard traffic pattern altitudes.

Why only "recommended?" Because at nontowered airports pilots must have the flexibility to react to changing wind conditions, intrusion of other traffic, and other possible emergencies they may encounter in the traffic pattern where there is no positive control—where the pilot-in-command is the local controller as well. Safe operations at nontowered airports is not a gray area of a pilot's pilot-in-command authority; it's definitely one of our responsibilities as well.

And, after all, we in the FAA rely on a system of voluntary compliance with the regulations, and the FAA feels that voluntary observance of standard traffic pattern procedures improves the safety and efficiency when operating at nontowered airports. It's as simple as everyone being where they are expected to be.

Of course, we have to say that the use of any standard traffic pattern procedure we describe here *does not alter the responsibility of each pilot to see and avoid other aircraft.*

General Practices

- Special circumstances or conditions—usually terrain or a man-made obstacle of some sort—may prevent the use of the recommended standard traffic pattern. If that is the case, learn the pattern in use for the particular airport. That may mean a phone call to the airport to talk to the manager or a local CFI—since the nonstandard pattern or the fact that it is non-standard may not be published anywhere.

- A pilot should familiarize him- or herself with all available information about an airport—particularly an unfamiliar one—as part of preflight planning. There are plenty of commercial publications which depict or describe airports, providing such information as runway orientation, length, and width; any aids to navigation or approach; lighting; traffic pattern altitude and direction; etc. Some state aviation agencies publish state airport guides, and FAA's *Airport/Facility Directory* (AFD) also includes this information. The AFD is reissued with any changes received every 56 days; state or commercial publications may be updated only annually or not at all. The one caveat to any printed source of this information is that it is the airport management's responsibility to report any changes in time for publication.

1. Enter the pattern in level flight, at traffic pattern altitude, and abeam the midpoint of the runway.

2. Maintain traffic pattern altitude and stay on the downwind leg until abeam the approach end of the runway.

3. The turn to final should be planned so that the airplane is established on a 1/4-mile final for the runway.

4. After takeoff or during a go around, continue straight ahead until beyond the departure end of the runway.

5. If remaining in the traffic pattern, turn to the crosswind leg when you are beyond the departure end of the runway and within 300 feet of traffic pattern altitude. Re-enter the downwind leg at traffic pattern altitude.

6. When departing the traffic pattern, fly straight out or exit with a 45º turn beyond the departure end of the runway but after reaching traffic pattern altitude. The 45º turn should be to the left for a left traffic pattern and to the right for a right traffic pattern.

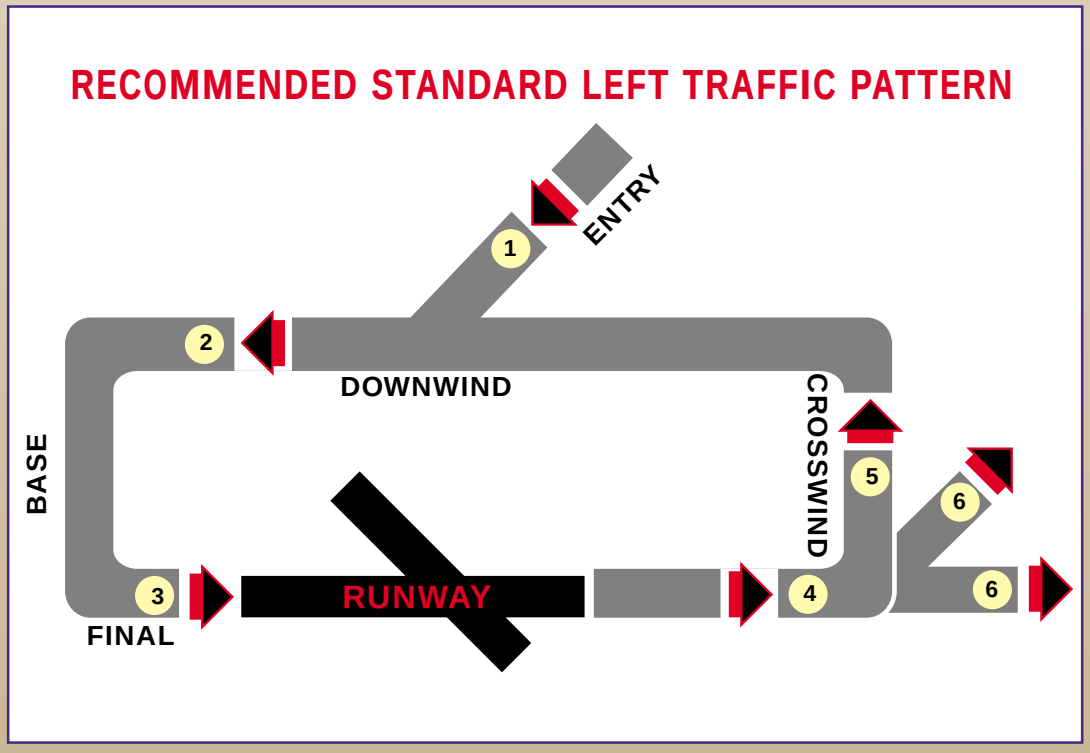


Figure 1

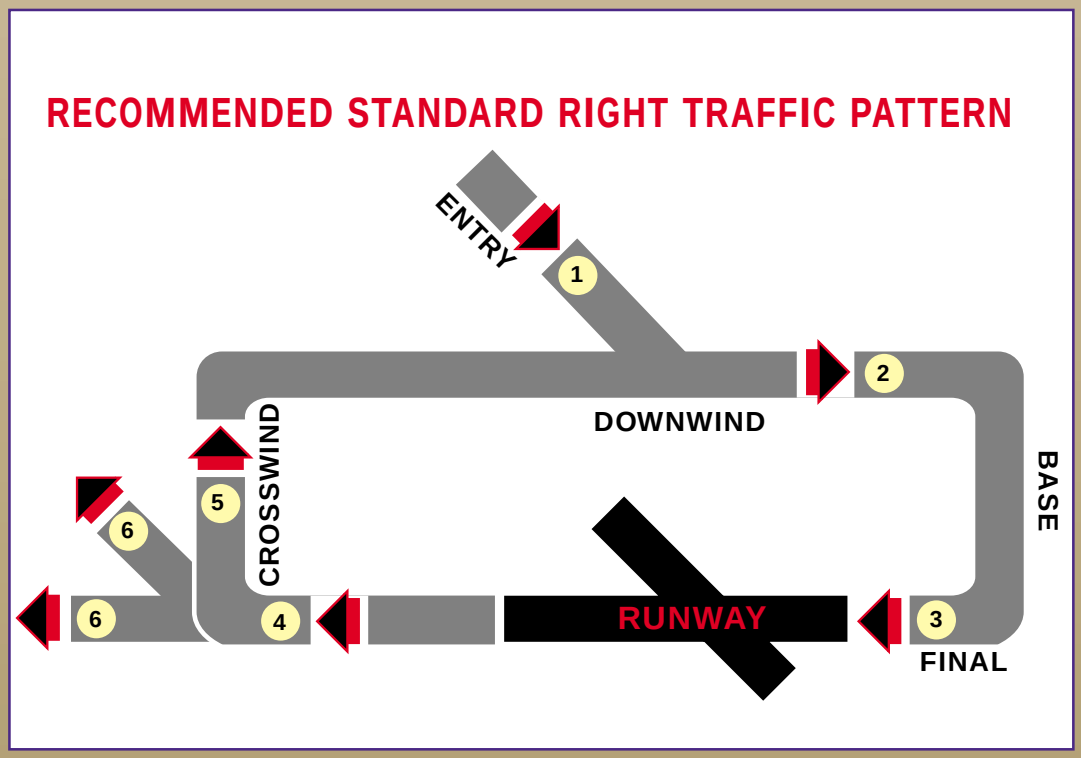


Figure 2

- At nontowered airports served by air carriers, all pilots must be alert for air carrier aircraft executing straight-in approaches. Straight-in approaches are the decision of the pilot-in-command, and communication of position and intent over the common traffic advisory frequency (CTAF) is vital for the air carrier pilots as well as any general aviation pilots in the pattern.

- All operators should look carefully at the need for straight-in approaches. There may be times when weather or traffic conditions favor the safety of the standard traffic pattern.

- Pilots practicing instrument approaches at nontowered airports need to learn more about the airport's busy traffic times and try to avoid those times. Even so, the safety pilot or instructor must be alert for other aircraft in the pattern. Practice instrument approaches should not interrupt the normal flow of traffic, and pilots in the pattern must again be alert for aircraft on a straight-in approach.

Recommended Standard Traffic Pattern

Figure 1 is a diagram of a standard left traffic pattern, applicable for all runways, unless the airport displays light signals or visual markings that indicate use of a right traffic pattern. A right traffic pattern is shown in Figure 2.

- Airplanes entering the traffic pattern at a nontowered airport should avoid the flow of traffic until established on the entry leg.
- Arriving airplanes should be at traffic pattern altitude before entering the pattern and should use a 45º angle to the downwind leg for entry. Entry should be abeam the midpoint of the length of the runway.

- Remember that the traffic pattern altitude is usually 800 to 1,000 feet above ground level (AGL)—that is, above the airport's elevation. Some publications report TPA as mean sea level (MSL), meaning the traffic pattern altitude has been combined with the elevation. An example would be an airport with an elevation of 600 feet plus an 800-foot AGL traffic pattern; aircraft should enter the pattern at 1,400 feet on the altimeter. In your preflight planning, make certain you know which figure is being used. Large or turbine-powered airplanes operate at higher traffic pattern altitudes, usually 1,500 feet AGL. Some military aircraft operate at traffic patterns of 2,500 feet or higher.

Maintain traffic pattern altitude on the downwind leg until you are abeam the approach end of the runway, and extend the downwind far enough to assure a 1/4-mile final. Again, terrain or obstacles may make that shorter or longer, but bear in mind that as you extend the downwind longer and longer, you will be equivalent to a straight-in approach.

It may seem overly simplistic to say, "Remember to land into the wind," but accidents and incidents have occurred on days of light wind, and two aircraft land on the same runway but in opposite directions.

This is where talking on and listening to the radio becomes important. (Traffic advisory practices will be featured in Part 3 of this series.)

Airplanes taking off or on go-around should fly straight ahead until they are beyond the departure end of the runway. Sometimes flight instructors, trying to get in as many pre-solo, practice takeoffs and landings as possible during a one-hour session, have their students turn crosswind to downwind too quickly. This is a "perfect" setup for the classic climbing high wing aircraft having a midair with a low wing aircraft established on downwind.

Similarly, if you are remaining in the traffic pattern, don't turn to crosswind until you are beyond the departure end of the runway and have climbed to within 300 feet of the traffic pattern altitude. Then, enter the downwind leg at the traffic pattern altitude.

If you are departing the pattern, continue straight out or exit the pattern with a 45º turn when beyond the departure end and after reaching traffic pattern altitude.

Adherence to a standard traffic pattern at nontowered airports—along with standard advisory practices and the pilot's duty to see and avoid other aircraft—is a safe alternative to a control tower. It is voluntary, but everyone should volunteer. It's sort of like giving blood—it only takes a few minutes of your time, it doesn't hurt, and everybody benefits. (Although you do get a cookie and some orange juice after giving blood...)

Of course, there will always be one pilot who decides that he or she is too experienced or his or her airplane too hot to have to deal with a standard traffic pattern. Peer pressure on such a pilot may effect an attitude change, and the exercising of peer pressure would be preferred to possible enforcement action for a careless or reckless operation.

It is certainly preferable to the worst of all possible alternatives—a midair collision.

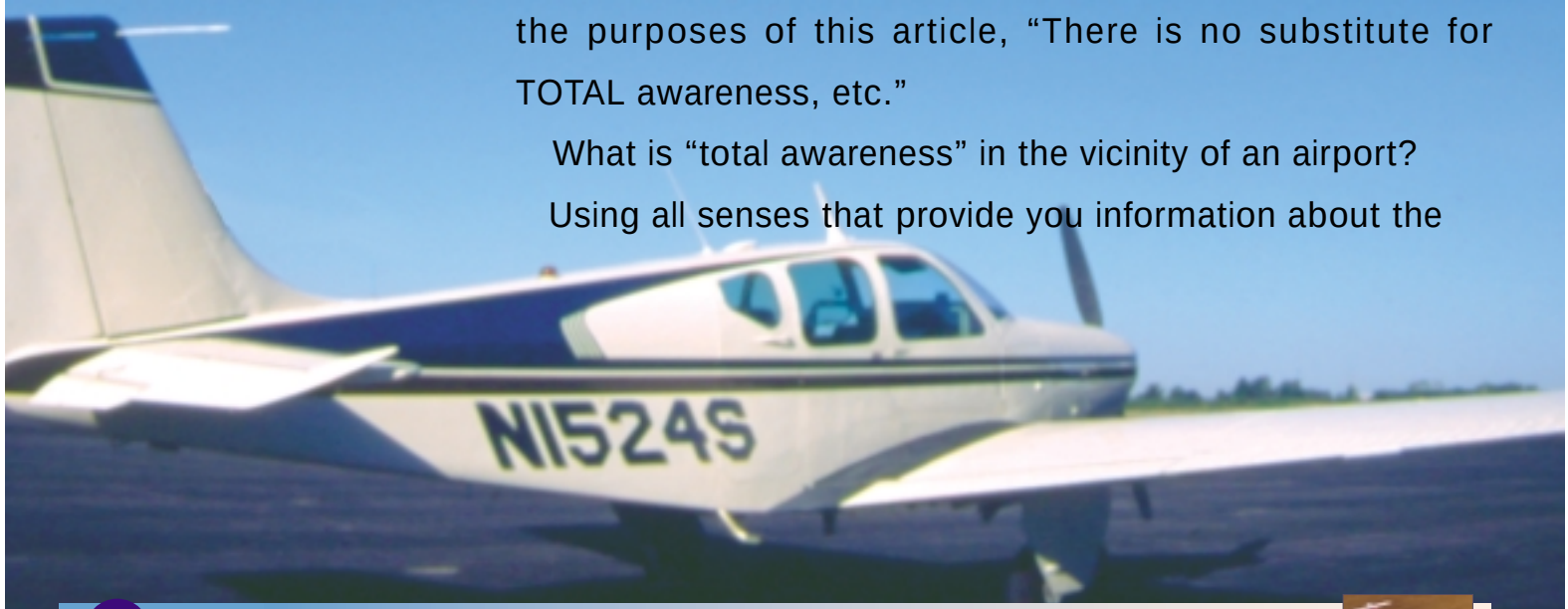
Traffic advisory practices add safety to operations at nontowered airports

Part 3 NO SUBSTITUTE FOR AWARENESS

by Phyllis-Anne Duncan

FAA Advisory Circular 90-45F, Traffic Advisory Practices at Airports Without Operating Control Towers, states fairly early on that, "There is no substitute for awareness while in the vicinity of an airport." We add for the purposes of this article, "There is no substitute for TOTAL awareness, etc."

What is "total awareness" in the vicinity of an airport? Using all senses that provide you information about the



traffic in the vicinity of an airport, particularly one without an operating control tower—or "nontowered airport."

The regulations require us to use only one sense—we have to see and avoid other aircraft. The use of both eyes and ears doubles your awareness, and you may hear what your eyes have "missed."

Part of "total awareness" is also the use of a bodily function that is not one of the five senses but something that we use everyday without hesitation. Yet, it seems sometimes when we are near an airport, we are struck mute.

What I'm talking about is speech. Your voice, out over the airwaves in the vicinity of an airport, could—along with your ears and eyes—save you from a ground collision or a near midair collision, a traumatic occurrence in and of itself. It could also save you from a worse trauma, a midair collision.

For Example...

Several years ago, an instructor in the Washington, DC area had a student with her whom she was readying for his private pilot checkride, and as part of the preparation the instructor was putting him through a simulated practical test.

It was mid-afternoon on a weekday, and it seemed they were in the only airplane around. Nevertheless, the radio was tuned to the airport's UNICOM frequency (also the airport's Common Traffic Advisory Frequency—CTAF), and the student was making all the appropriate broadcasts. The radio was working; they knew this because the UNICOM operator acknowledged their "radio check" and several of their broadcasts. The student had re-checked transmission and reception again after leaving the traffic pattern for some airwork then returning to practice takeoffs and landings. No one else was announcing his or her presence at the nontowered airfield east of Washington, DC.

After several successful takeoffs and landings of all types, the instructor decided to introduce an emergency for the student —an aborted takeoff. The instructor knew this could be done safely at this airport because years ago her instructor had done it with her there. The instructor also knew at what point on the takeoff roll she could call for the abort and still have plenty of runway left to rollout on. The student and instructor had discussed aborted takeoffs and had practiced them before.

The instructor called for the abort, and the student handled it just fine, calling out the steps and taking the proper actions, including announcing on the CTAF that the aircraft was aborting a takeoff. At this particular airport, the taxiway entrances were few—only two turnoffs, which were both behind the aircraft after the abort. The student announced on the CTAF that he was back-taxiing on the runway and began to turn the aircraft around.

Bearing down on them was a light twin. The instructor took over the aircraft and steered it toward the grass at the side of the runway. The twin rotated and passed over the Cessna 152, causing both instructor and student to duck out of reflex.

"What did I do wrong?" was the student's first question, worried that he might have done something wrong or might not be recommended for his flight check.

The instructor replied that most likely the hapless student hadn't done anything wrong. Anyway, she turned it into a lesson on collision avoidance.

"What do you think caused this?" she asked, and they discussed how probably the pilot of the twin had not been monitoring the radio and did not realize that they were still on the runway. The student went home sobered and a little shaken, and the instructor waited a number of hours for the twin to return.

In a conversation with the twin's pilot, she determined that he had, indeed, left the radios off, for no good reason, admittedly. Besides, what was the problem? There had been no accident.

This long example simply shows that while eyes looking out for other aircraft to avoid works well, ears listening for a traffic advisory might have made the twin pilot delay his takeoff until hearing a "clear of the active" announcement. There would have a been a lot less excitement all around.

Mike Fright?

The reasons why people can't or won't talk on the radio at nontowered airports are varied. Of course, it's easy to say you don't have to talk on the radio at a nontowered after all. Or "It's too noisy and distracting." Or "I don't want to add more chatter to an already congested frequency."

Perhaps it helps to think of talking on the radio at a nontowered airport not as a one-way event but as an exchange of information. You're not only telling someone where you are, but that someone else may be listening and, better yet, may respond to let you know a vital piece of information—his or her location in the pattern.

Some people can be as loquacious as anyone in social situations or with their families, even on the telephone, but when they hold a microphone up in front of their faces, they freeze. No one wants to sound like an idiot on the radio where other pilots are listening, and that could intimidate them enough to keep them from talking. This, fortunately, can be overcome with patience and practice. I had a student who would break into cold sweats at the thought of actually talking on the radio, so we practiced and practiced on the ground with an unplugged mike. We listened to radio communications at other airports—towered and nontowered—and finally he decided this was kind of cool. He got to the point where he didn't want me to help anymore, and his voice would drop an octave as he spoke—we called it his "airline captain's voice." Whatever—it worked for him. This is an adversity that most can overcome. Of course, listening doesn't require you to speak, but remember for communication to be successful, one must listen and speak.

But What Do I Say?

An interchange between pilot and controller is fairly straight-forward. A great deal of this communication is repeating clearances or instructions, and many people have less trouble with this than transmitting in the blind at a nontowered airport. The AC we mentioned above outlines traffic advisory practices, and we'll summarize them here. The *Aeronautical Information Manual* (AIM), paragraph 4-1-9, also includes information on traffic advisory practices at nontowered airports.

But before we talk about what to say, let's back up to something extremely important—identifying the frequency you should broadcast on.

Each airport without an operating control tower has a Common Traffic Advisory Frequency (CTAF) designated for it. The CTAF may be the frequency of the tower when it is operating—at airports with towers but where the tower doesn't operate 24 hours a day. It may be the frequency of the flight service station (FSS), if there is one on the field, or it could be the airport's UNICOM or MULTICOM frequency. The CTAF for an airport is published in the *Airport/Facility Directory* (AFD), on aeronautical charts, on instrument approach procedures, and on standard instrument departure (SID) procedures.

AAS from FSS

At airports with an FSS, pilots can receive the airport advisory service (AAS) from the FSS. This advisory will provide you with the wind direction and velocity, favored or designated runway, altimeter setting, known traffic (the unknown traffic being those whose opted not to use this service), NOTAM's, airport taxi routes, traffic pattern, and instrument approach procedure information. However, the AAS does not function as positive control—these are simply advisories, not all of this information may be available all the time, and there is no requirement to talk to the FSS at the airport. So, while you may be gleefully chatting away with the specialists, don't forget to use that other sense to see and avoid pilots who may not be so communicative.

When inbound, establish two-way communications with the FSS at least 10 miles from the airport. Report your altitude, aircraft type, and location relative to the airport. Indicate whether you intend to land at the airport or are merely overflying. If you are landing, now is the time to request the airport advisory.

When departing an airport with an FSS, report to the FSS on the CTAF that you're about to taxi, when you enter the airport's movement area, and when you taxi onto the runway—and which runway you're departing from. Once airborne you can advise the FSS on the CTAF the aircraft type, full identification number, type of flight planned, etc. Remember, other pilots approaching the airport or overflying it may be listening. Your broadcast on the CTAF will get them looking for you, and if they see you, they can avoid you.

Example of AAS Phraseology:
Inbound:
"Vero Beach Radio, Centurion six niner delta delta, one zero miles south, two thousand, landing Vero Beach. Request airport advisory.
Outbound:
"Vero Beach Radio, Centurion six niner delta delta, ready to taxi, VFR, departing to the southwest from runway 22. Request Airport Advisory."

Note, too, that the number of airports with active FSS's on the field is fewer and fewer each year. Consequently, you need to consult current information to establish the CTAF for an airport.

Self-Announcing Position or Intentions

A new pilot may feel the silliest when he or she

"self-announces," but self-announcing on the published CTAF is the best and perhaps the only way to let others know what you're doing at a nontowered airport.

Practice approaches at nontowered airports can offer a unique situation where the wind direction may indicate the use of a runway opposite the direction of the published approach. Pilots on practice approaches should announce on CTAF:

1. When leaving the FAF inbound

2. When established on the final approach segment or immediately upon being released by ATC

3. Upon completion or termination of the approach or upon executing the MAP

Aircraft departing the airport where practice approaches occur frequently must, of course, look out for aircraft on the approach, listen for aircraft transmitting practice approach intentions on CTAF, and broadcast their own intentions on CTAF.

Frequency Congestion

Frequency congestion is most commonly cited by pilots at nontowered airports as the reason why they don't bother to "self-announce." They just can't get a word in edgewise. However, if all pilots followed recommended standard phraseology, everyone would have ample opportunity to get their message across. In a few succinct phrases, you can broadcast your position and intentions to other pilots, and they will be able to identify easily if you are traffic relevant to them or not. When you hear a "self-announcement" in the proper phraseology, you, too, will be able to discern all the information needed to assist you in your traffic scan. Part of effective scanning is knowing where to look.

Communicating on UNICOM or MULTICOM

UNICOM is what pilots at nontowered airports are most familiar with. MULTICOM is the frequency to use when there is no tower, FSS, or UNICOM, and it is commonly referred to as the "air-to-air" frequency. Your response when broadcasting on MULTICOM will most likely be from other pilots in the traffic pattern.

If you adhere to the following six steps, your inbound or outbound communications on UNICOM or MULTICOM will reduce frequency congestion, provide

DESIGNATED UNICOM/MULTICOM FREQUENCIES

Frequency	Use
122.7	Airports without an operating control tower
122.725	Airports without an operating control tower
122.750	Air-to-air communications and private airports (not open to the public)
122.8	Airports without an operating control tower
122.9	MULTICOM; activities of a temporary, seasonal, or emergency nature
122.925	MULTICOM; forestry management and fire suppression, fish and game management and protection, and environmental monitoring and protection
122.950	Airports with control tower or FSS on airport
122.975	Airports without an operating control tower
123.0	Airports without an operating control tower
123.050	Airports without an operating control tower
123.075	Airports without an operating control tower

Note: Wind direction and runway information may not be available on 122.950.

sufficient information to those listening, and enhance safety.

1. Select the correct CTAF. 'Nuff said about that already.

2. State the identification of the UNICOM station; i.e., the airport which you're using. This could be the most important part of the transmission when you have several airports in an area on the same UNICOM frequency. Other pilots need to know precisely which airport you intend to use. Suggested practice is to begin and end each announcement with the airport's name.

3. Speak distinctly. AC 90-42F also says to speak "slowly," but I don't want that misinterpreted because other people are waiting to use the frequency. Speak slowly enough that your words are not slurred together but quickly enough that others won't be agitated over the time you're taking. A good cadence will come from listening to others and with practice. (I'm from Virginia, which is technically the South, but northern controllers have accused me of drawling while southern controllers have said, "Whoa, you're talkin' too fast for me!" Sometimes you can't win.)

4. When inbound, call UNICOM or on MULTICOM about 10 miles from the airport, report your altitude, aircraft type, n-number, location relative to the airport, and whether you're landing or overflying. Request wind information and runway in use. When departing an airport, request wind and runway information before beginning your taxi-out. UNICOM operators from the airport will usually say "local traffic in the pattern" when they respond to either an inbound or outbound announcement, but if you don't hear that, you can always ask how many are in the pattern, bearing in mind that this can and probably will change any minute.

5. When inbound, report when you enter downwind, base, and final.

6. Report when you turn off the active runway after landing, indicating to others in the pattern that the runway is available for use. When outbound, announce that you are departing the runway in use and indicate whether you're remaining in the pattern or departing the area.

Examples of Suggested Phraseologies:

Inbound, at least 10 miles from the airport:
"Frederick UNICOM, Cessna eight zero one tango foxtrot, 10 miles southeast, descending through [altitude], landing Frederick. Request airport advisory, Frederick."
Then,
"Frederick Traffic, Cessna eight zero one tango foxtrot entering downwind/base/final [as appropriate] for runway one niner, full stop [or touch and go, as appropriate], Frederick."
Finally,
"Frederick traffic, Cessna eight zero one tango foxtrot, clear of runway one niner, Frederick."

Outbound:
"Frederick UNICOM, Cessna eight zero tango foxtrot at [location on the airport] taxiing, request airport advisory, Frederick."
As you taxi onto the active runway:
"Frederick traffic, Cessna eight zero one tango foxtrot, departing runway one niner, remaining in the pattern [or 'departing the pattern to the {direction},' as appropriate], Frederick."

This phraseology is good for either UNICOM or MULTICOM, but it is particularly important when on MULTICOM to repeat the name of the airport at the end of the transmission. As you become more accustomed to this phraseology, you will find ways to eliminate words and still get the message across.

SUMMARY OF RECOMMENDED COMMUNICATIONS PROCEDURES

		Communication/Broadcast Procedures		
Facility at Airport	Frequency Use	Practice Approach	Outbound	Inbound
UNICOM (no tower or FSS)	Communicate with UNICOM on published CTAF (122.7, 122.8, 122.725, 122.975, 123.0) If unable to contact UNICOM self-announce on CTAF.		Before taxiing and before taxiing on the runway for departure	10 miles out. Entering downwind, base, and final. Leaving the runway.
No tower, FSS, or UNICOM	Self-announce on MULTICOM, 122.9	Departing FAF (name) or on final approach segment inbound		
No tower operating, FSS open	Communicate with FSS on CTAF	Approach completed/ terminated		
FSS closed, no tower	Self-announce on CTAF			
Tower or FSS not operating	Self-announce on CTAF			

Conclusion

Again, a direct quote from AC 90-42F sums up this article best: "Operations at airports without operating control towers require the highest degree of vigilance on the part of pilots to see and avoid aircraft..." Sometimes your ears can assist your sight, and sometimes your voice can help others "see" you. Safe operations at non-towered airports require us to stay alert and aware, to expect the unexpected, and to use the CTAF.

AVOIDING DISASTER

Defining the pilot's role in collision avoidance

by Phyllis-Anne Duncan

FAR § 91.113(b) requires the pilot to "see and avoid" other aircraft, to wit:

"When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft."

It seems cut and dried, but what if you're in a radar environment, squawking and obvious to a controller who gives you traffic advisories? What if you have TCAS to give you climb or dive instructions? No change. You, the pilot, must continue to see and avoid.

In some ways this is the most fundamental of all our piloting and safety responsibilities. Avoidance may be the easy part; seeing may be a little more difficult. After all, it is not so easy as simply staring out the windscreen for any flying object to cross your path. You have to know where to look and what you're looking for; then, in a brief amount of time assess the situation and determine the best course of action to avoid the tragic occurrence of two aircraft attempting to defy physical laws and occupy the same airspace at the same time.

This is the last of a series of articles on operations at nontowered airports, a series which was initiated in light of a collision between an air carrier aircraft and a general aviation aircraft at the nontowered airport in Quincy, IL. Whereas the National Transportation Safety Board (NTSB) has not yet reached its conclusion as to the probable cause of the accident, its circumstances were sufficient to publish reminders of our pilot-in-command responsibilities concerning collision avoidance.

Part 1 was an overview and contained some general safety information; Part 2 dealt with recommended standard traffic patterns at nontowered airports; Part 3 covered radio advisory practices at nontowered airports; and finally here we will discuss what pilots can do to see and avoid and, thus, faithfully execute their roles in collision avoidance.

So much for the plugs for FAA safety programs. (Well, we have to.) Now, let's talk about our role in collision avoidance. Some of what we'll cover in this article is designed for traffic avoidance at altitude but is directly applicable for operations at nontowered airports.

MAC and NMAC

The very words "mid-air collision" (MAC) are sufficiently disturbing to any pilot, and perhaps we tend to think that MAC happen to the "other pilot." After all, your scan is good and well-practiced. Why wouldn't any other pilot's not be as good? In reality even the most vigilant pilot gets distracted—by a passenger's question, a wonderful piece of scenery, an inflight emergency. That's why distractions are taught during primary training and tested during the practical test. However, we shouldn't give over any of our responsibility to the "other pilot" and not assume that because we look out the window the other pilot is also. Pilots may have to adapt the highway safety theme of defensive driving—"Watch out for the other guy!"

The "see and avoid" concept involves a bit more complexity than the quote above from the FAR that "vigilance shall be maintained at all times." According to advisory circular 90-48C, "Pilots' Role in Collision Avoidance," seeing and avoiding requires situational awareness, expecting the unexpected, and the commitment to doing what has to be done to avoid a collision. In the air while closing on each other at a significant rate is no place to assume that the "other pilot" will alter course. Since most MAC and near mid-air collisions (NMAC) occur in VFR weather and in daylight, we have nothing to "hide" behind in assuming our role in collision avoidance.

Visual Scanning and the Limitations of the Eye

Countless hours of philosophical debate have occurred on the nature of reality. If I see something is it real or is it just my visual perception? In aviation, our debate is not so esoteric. Several hundred pounds of metal and plastic in a close encounter is real no matter which side of the philosophical argument you come down on.

SOMETIMES YOU JUST HAVE TO WAIT YOUR TURN

That is the conclusion of an article entitled, "Dangerous Practices Becoming Common at Uncontrolled Aerodromes," printed in the 2/97 issue of the *Aviation Safety Letter* of Transport Canada. Since what is described in the article fits in with our "operations at nontowered airports" series, please read on.

"Few small aerodromes benefit from the luxury of parallel taxiways or holding bays near the runway threshold. They are one-runway operations. Arriving and departing aircraft have to sequence themselves properly to avoid conflict. It can be particularly annoying when the parking area is at the far end and a long taxi is involved before a pilot can get into position to safely do a run-up and depart. Some pilots have to wait to taxi, or others have to wait to land.

"As a result, in the interest of expediting traffic, pilots are developing dangerous habits, habits that are not only being accepted but also, on occasion, being taught by instructors.

"Pilots create their own parallel taxiways, in the grass, just off the runway. These are being used while other aircraft are arriving and departing. Aerodrome standards require that parallel taxiways be far enough from the runway to guarantee wingtip clearance plus a big safety margin. This means several hundred feet away, not just off the runway surface on the nicely graded and prepared area....

"By mutual arrangement some pilots are landing over top of other aircraft, some are backtracking, and others are waiting for takeoff on the threshold.

"Last, but not least, parallel takeoff/landing operations occur, with some pilots using the runway while others use the adjacent grass. The runway user conform to the recommended left-hand circuit pattern; the grass users do both left- and right-hand circuits.

"These are very dangerous practices. Picture a sunny weekend when everybody wants to fly. Picture a couple of arriving and departing transient pilots who don't know the local habits. Picture a collision.

"Sometimes you just have to wait your turn."

As humans we take in most of our information—over 80% according to some studies—visually. In flight, we use our eyes to read and interpret instruments, maintain level flight, and see obstructions. The simple reality is that you can avoid what you can see, but you have to look for it. The "head on a swivel" image is one that flight instructors emphasize constantly to primary students, and, though physically impossible, it is a concept that should continue throughout our aviation careers. Our heads may not swivel so easily (horror movies aside), but our head and eyes can move—from side to side, up and down—and our torsos can turn and move as well.

We have to understand somewhat the limitations of the eye; after all, I said 80% above, not 100%. Our eyes are physically vulnerable to anything our bodies are: fatigue, disease, age, illusions, alcohol, drugs, stress, even the odd, dislodged eyelash. Even though our eyes may be working perfectly, outside conditions can affect our vision—distortions from the windshield, haze in the atmosphere, too much or too little oxygen, glare, lightning, etc.

The mind also affects what the eyes see; i.e., we can see or recognize only that which the mind has reference for. Even familiar objects can be unrecognized by the pilot whose mind is somewhere else—daydreaming or thinking about the business deal about to be closed.

AC 90-48C stresses constant alertness "to all traffic movement within [the] field of vision, as well as periodically scanning the entire visual field." That visual field expands as we move our heads and look—carefully—outside the aircraft. Of course, expanding the visual field means we have to establish a quality visual scan. A visual scan is most effective when it consists of short, regularly spaced eye movements that do not exceed 10 degrees at a time. Each 10-degree "block" should be observed for at least one second.

One of the biggest limitations of the eye is the time it needs to refocus or accommodate. That accommodation is automatic, but changing from something fairly close-up (the instrument panel) to an object a mile or more away, takes a second or two, particularly if your eyes are not up to par. One or two seconds seems like a short time, but it has been estimated that to see, identify, calculate the evasive action required to avoid a mid-air collision, and then take that action could take 10 to 12 seconds.

Objects seen "out of the corner of the eye" should not be ignored. True, they usually end up being nicks in the Plexiglas or bug smears, but they still warrant checking out. When you move your eyes to a new spot and refocus, your peripheral vision compensates while that refocussing occurs, and movement is more often perceived under some conditions by peripheral vision than head-on. Spotting objects at night depends almost entirely on your peripheral vision, and pilots are advised not to look directly at an object to determine relative motion but rather slightly to one side of it.

Day or night, if you see an aircraft ahead of you and it appears to have no motion relative to you, you are on a collision course. If the aircraft has no vertical or lateral motion but appears to grow in size, evasive action is required—NOW!

How and Where to Scan

Your scan should be consistent and standardized and should always include dropping your eyes down to scan the instrument panel. Some pilots find it comfortable to start in the middle of the visual field, scan in 10º "blocks" left, drop down and scan the panel from left to right, then scan the remainder of the visual field blocks from the right back to center.

Others start left, move across the entire visual field, then scan the panel from right to left before returning to the visual field at the left. The

point is to develop your own personal scan around these parameters—whatever is comfortable and works for you.

Generally, scanning an area 60º to the right and left of the center visual area covers most of the sky, especially if you scan 10º up and down as well.

Your scan may have to change for the type of aircraft that you fly, and you'll need to program your "evasive action" trigger to go off a little quicker when you are operating a high-performance or high-speed aircraft. In a slower airplane you are exposed to the collision hazard longer.

Many pilots may neglect their scans once entering the traffic pattern, being busy with communicating location through the pattern and pre-landing checklists. But continuing a visual scan for traffic may be the most important part of the traffic pattern procedures at nontowered airports, since some pilots do not make the recommended standard traffic patterns a habit.

Clearing the Air

Clearing turns are also an important part of our role in seeing and avoiding other aircraft. Surrounded by solid fuselage, we have to move ourselves and the aircraft to see areas of the visual field that are hidden from our scans. Before takeoff at any airport, but particularly at nontowered airports, position your aircraft on the taxiway so that you can scan the entire approach area before taxiing onto the runway for takeoff.

Of course, we're all familiar with "clearing turns" done at altitude before performing maneuvers that block the visual field; i.e., stalls, flight at minimum controllable airspeed. The question arises, how often to perform clearing turns. Sometimes, instructors, mindful of the time they want to spend actually teaching, tell students to perform one set of clearing turns right and left over the practice area and no

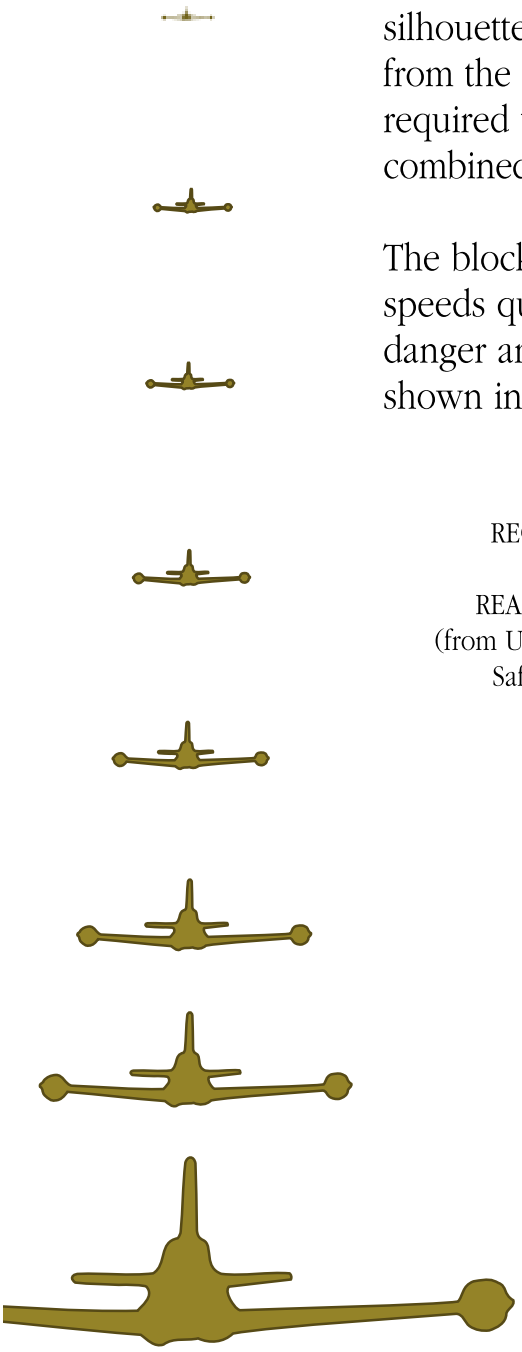
DISTANCE - SPEED - TIME

MPH ▶	600	360
	SECONDS	
10 miles	60	100
6 miles	36	60
5 miles	30	50
4 miles	24	40
3 miles	18	30
2 miles	12	20
1 mile	6	10
0.5 mile	3	5

CRITICAL SECONDS

Move back 12 feet from this illustration. From that position the silhouettes represent a T-33 aircraft as it would appear to you from the distances indicated in the table on the left. The time required to cover these distances is given in seconds for combined speeds of 360 and 600 mph.

The blocks on the lower left mark the danger area for the speeds quoted, when aircraft are on a collision course. This danger area is based on the recognition and reaction times shown in the table on the lower right.



RECOGNITION
and
REACTION TIMES
(from U.S. Naval Aviation
Safety Bulletin)

Excerpt

	Seconds
see object	0.1
recognize a/c	1.0
become aware of collision course	5.0
decision to turn left or right	4.0
muscular reaction	0.4
aircraft lag time	2.0
TOTAL	12.5

OTHER LIMITATIONS OF THE EYE

Empty Field Myopia

At high altitude or at low altitude on overcast or hazy days, the eye may not have any distinct object to focus on, so it doesn't focus. This is called empty field myopia, and the result is we stare and stare and see nothing. The only way to counter this is to find something to focus on—a wisp of cloud, even that smashed bug on the windshield.

Binocular Vision

Because we have two eyes side by side and facing forward, we actually have two visual fields. Look at an object with both eyes, then alternate closing first one eye, then the other. The object appears to move. That's because we're "switching" between two visual fields. With both eyes open, our brain compensates and merges the two fields so we see a single representation. If a doorpost or lowered sun visor blocks one eye's visual field we are reducing what we can see. Again, move your head and restore your full visual field.

Narrow Field of Vision

Our eyes take in light in an arc of about 200º but our favored field of vision is much narrower—10º to 15º. Within this narrow field of vision is where we focus then classify objects. We can perceive movement in our peripheral vision, but we tend not to believe what we see there. When we "trust" only that narrow field of vision, we are said to have "tunnel vision."

Limited Vision

Limited visibility may mean clouds, haze, or fog restricting visibility, but it also means limited vision as well. In such a situation, you must be particularly vigilant and prepared to take immediate action to avoid an airplane suddenly emerging from the haze.

Lightning and Glare

Lightning and glare can "over-saturate" our field of vision and can make scanning uncomfortable. Lightning can leave behind that floating ball—similar to what you get from a camera flash—and effectively block out a whole section of your field of vision for a long time. Contending with glare can be painful and tiring, but the use of glare-blocking sunglasses may also filter out your ability to see other aircraft.

Cluttered Background

Here on the east coast the level of development is so extensive that obtaining contrast between the ground and an object in the air below you is very difficult. Even a brightly colored airplane can blend into the background, but you must be especially careful for camouflaged, military aircraft when you do fly in rural areas.

Cockpit Myopia

Fatigue and stress have a tendency to make us focus on a single thing, usually one instrument inside the cockpit. After you stare at it long enough, you see little else, and you certainly don't see anything outside the airplane. That is why it is important to continue your visual scan of your instruments and for traffic even when you are dealing with an emergency.

Smoking

The eye needs oxygen to work properly, and tests have shown that smoking elevates the levels of CO in the blood. Thus, the eye's ability to see anything is reduced.

more. Traffic is dynamic, and an area clear a few seconds before may become occupied. AC 90-48C suggests clearing turns "at a frequency which permits continuous visual scanning of the airspace," but that still leaves a lot to be guessed at. Every couple of minutes is probably ideal, and remember that if you move your head and look around doorposts, etc., the clearing turns may not have to be full 180's.

Instructors, Examiners, Safety Pilots, and Passengers

Some of the best teaching an instructor can provide a student is by example. If a student observes his or her instructor consistently practicing a thorough scan for traffic, the student is bound to develop that good habit as well. A flight instructor who talks about the importance of scanning for traffic while doing it is gilding the lily.

The same holds true for examiners. Their purpose, of course, is to test the pilot applicant, but they are also a second set of eyes during the flight. Not only do they observe the pilot's scan and assess it, they must practice it as well. However, both flight instructors and examiners have to be careful about becoming so preoccupied with instructing or testing that they "go inside" too often or too long.

A safety pilot's primary job, particularly during simulated instrument flight, is to do what the pilot can't—look outside. Even if you're a second pilot flying with a pilot friend, two scanners are always better than one. So, do you split the scanning duties; i.e., "I'll take the right side—you take the left," or do you overlap the scans? The latter is probably better; one of you might catch something the other missed.

Passengers, too, should be "trained" to scan. Put them to work. Again, that extra pair of eyes may come in handy just when you need it.

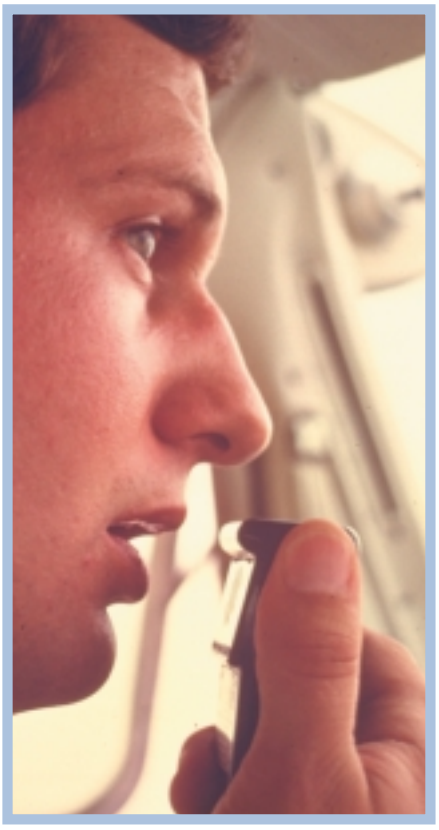
Conclusion

Probably the most telling picture I've ever seen is the two-page illustration we have provided on pages 16 and 17, which graphically (no pun intended) illustrates how a tiny, obscure speck on the windshield can blossom to a full-grown airplane in seconds. They can be the most awful few seconds of your life, and they mustn't be the last.

They don't have to be at nontowered airports if we use standard traffic patterns, communicate our position with advisories, and visually scan the airspace we share with others.

That's our role in midair collision avoidance.

This article is based in part on AC 90-48C, "Pilots' Role in Collision Avoidance," and former Accident Prevention Program Safety Pamphlet, FAA-P-8740-51, "How to Avoid a Midair Collision."



COLLISION AVOIDANCE CHECKLIST

1. **Check yourself.**
2. **Plan ahead.**
3. **Clean your windows.**
4. **Adhere to SOP.**
5. **Avoid crowds.**
6. **Compensate for design.**
7. **Equip for safety.**
8. **Talk and listen.**
9. **SCAN!**

Check yourself. Are you ready to fly and physically fit to be able to see and avoid? Your mental and physical condition affect your eyesight.

Plan ahead. Fold your charts in sequence before you get in the cockpit and keep them within reach. This saves you precious inside time searching, selecting, checking, and folding while trying to fly and scan for traffic. Refresh yourself on headings, frequencies, distances, and so on before flight. Write them down in a flight log and also have them handy before flight.

Clean the windows. "I don't do windows!" doesn't cut it in collision avoidance. If your windshield is a field of smashed bugs, they not only can "hide" an airplane, you become inured to the specks and may not heed the one that you spot peripherally; it may be an airplane and not some unfortunate arthropod. Keep sun visors and curtains out of the way .

Adhere to SOP. The use of position reporting and standard traffic patterns cannot be emphasized enough; that's why we keep harping on them.

Avoid crowds. This is a little hard to do at a busy airport, nontowered or towered. Enroute, avoid flying directly over a VOR and overfly airports at a safe altitude, paying special attention when you are within 25 miles of military airports or busy civilian ones. Military airports have high concentrations of fast jet traffic, and their traffic patterns can extend up to 2,500 feet. (Refer to pages 16 and 17 for an example of closure rates.)

Compensate for design. Know your aircraft's blind spots, particularly those associated with high-wing and low-wing aircraft during turns. Final approach at non-towered airports has provided one of the most dangerous situations in aviation: the faster, low-wing airplane overtaking and descending on top of a slower, high-wing airplane.

Equip for safety. Systems which were formally too expensive for aircraft are now within a pilot's economic grasp. High intensity lighting, hand-held transceivers, etc., can cost less than $200 apiece. The lights increase your contrast and visibility to others, and the radios allow you to communicate your position and hear others'. Headsets, now also inexpensive, allow you to hear better, and push-to-talk switches allow you to communicate without reaching for a mike.

Talk and listen. Eyes and ears used together can improve upon the 80% information that eyes-only provide. Listening to another pilot's position reports allows you to visualize his or her position in relation to you, especially in a busy nontowered airport traffic pattern.

SCAN! Look ahead to where you're going to be and make sure there are no other airplanes there. Scan constantly and consistently. Minimize your inside-the-cockpit time. A good scan, like a good pilot, requires training. Teach your eyes to reveal not only the beauty and excitement of flight but also obstructions and other traffic.

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